

Claims

What is claimed is:

1. An apparatus for receiving an input signal and outputting a recovered modulated signal, the apparatus comprising:
  - a. a superhet receiver for receiving the input signal and for outputting an in-phase signal and one or more phase shifted signals;
  - b. a plurality of monostables for receiving the in-phase signal and one or more phase shifted signals, each monostable producing an output pulse;
  - c. a summing circuit coupled to each of the monostable output pulses for combining the monostable output pulses into a composite waveform and outputting the composite waveform; and
  - d. a filtering circuit for receiving the composite waveform, recovering a modulated signal and outputting the modulated signal.
2. The apparatus as claimed in Claim 1 wherein one of the phase shifted signals is in phase quadrature to the in-phase signal.
3. The apparatus as claimed in Claim 1 wherein the superhet receiver comprises:
  - a. an image reject mixer for converting the input signal into an in-phase intermediate-frequency (IF) signal and a phase-shifted IF signal; and
  - b. an IF filter coupled to the image reject mixer for outputting the in-phase and phase-shifted IF signals.
4. The apparatus as claimed in Claim 3 wherein the monostables are configured into monostable pairs such that the number of monostable pairs is equal to the number of

output signals from the superhet receiver.

5. The apparatus as claimed in Claim 4 wherein the monostable pair comprises:
  - a. a first monostable; and
  - b. a serial circuit coupled in parallel to the first monostable, the serial circuit includes an inverter and a second monostable wherein the output of the inverter is coupled to the input of the second monostable.
6. The apparatus as claimed in Claim 5 wherein the monostable pair receives a corresponding one of the superhet receiver output signals.
7. The apparatus as claimed in Claim 6 wherein the output pulse of the first monostable of the monostable pair is triggered by a rising edge of the corresponding one of the superhet receiver output signals and the output pulse of the second monostable of the monostable pair is triggered by the falling edge of the corresponding one of the superhet receiver output signals.
8. The apparatus as claimed in Claim 7 wherein the output of the superhet receiver comprises an in-phase signal and a signal in phase-quadrature to the in-phase signal.
9. The apparatus as claimed in Claim 8 wherein a first monostable pair receives the in-phase signal and a second monostable pair receives the signal in phase-quadrature.
10. The apparatus as claimed in Claim 9 wherein the input signal to the superhet receiver is a radio-frequency signal and the output signals from the superhet receiver are intermediate-frequency signals.

11. The apparatus as claimed in Claim 10 wherein the output composite waveform from the summing circuit comprises one pulse, multiplied by the number of monostables, for each cycle of the in-phase intermediate-frequency signal.
12. The apparatus as claimed in Claim 11 wherein the output pulse of the monostable includes a pulse period, the pulse period is equal to one-half the nominal IF period.
13. A method of demodulating an FM signal using a superhet receiver and a demodulator, the method comprising the steps of:
- a. applying an input signal to a superhet receiver for generating an in-phase signal and one or more phase shifted signals;
  - b. providing the in-phase signal and the one or more phase shifted signals to a plurality of monostables for generating a plurality of generated output pulses;
  - c. summing the plurality of generated output pulses from each of the plurality of monostables in a summing circuit for forming a composite waveform; and
  - d. filtering the composite waveform from the summing circuit in a filtering circuit for outputting a modulated signal therefrom.
14. The method as claimed in Claim 13 wherein one of the phase shifted signals is in phase quadrature to the in-phase signal.
15. The method as claimed in Claim 14 wherein the input signal to the superhet receiver is a radio-frequency signal and the output signals from the superhet receiver are intermediate-frequency signals.
16. The method as claimed in Claim 15 wherein the output composite waveform from the summing circuit comprises one pulse, multiplied by the number of monostables, for each

cycle of the in-phase intermediate-frequency signal.

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17. An apparatus for receiving an input signal and outputting a recovered modulated signal, the apparatus comprising:
- a. means for applying an input signal to a superhet receiver for generating an in-phase signal and one or more phase shifted signals;
  - b. means for providing the in-phase signal and the one or more phase shifted signals to a plurality of monostables for generating a plurality of generated output pulses;
  - c. means for summing the plurality of generated output pulses from each of the plurality of monostables in a summing circuit for forming a composite waveform; and
  - d. means for filtering the composite waveform from the summing circuit in a filtering circuit for outputting a modulated signal therefrom.
18. The apparatus as claimed in Claim 17 wherein one of the phase shifted signals is in phase quadrature to the in-phase signal.
19. The apparatus as claimed in Claim 18 wherein the superhet receiver comprises:
- a. an image reject mixer for converting the input signal into an in-phase intermediate-frequency (IF) signal and a phase-shifted IF signal; and
  - b. an IF filter coupled to the image reject mixer for outputting the in-phase and phase-shifted IF signals.
20. The apparatus as claimed in Claim 19 wherein the monostables are configured into pairs such that the number of monostable pairs is equal to the number of output signals from the superhet receiver.

21. The apparatus as claimed in Claim 20 wherein the monostable pair comprises:
- a. a first monostable; and
  - b. a serial circuit coupled in parallel to the first monostable, the serial circuit includes an inverter and a second monostable wherein the output of the inverter is coupled to the input of the second monostable.
22. The apparatus as claimed in Claim 21 wherein the monostable pair receives a corresponding one of the superhet receiver output signals.
23. The apparatus as claimed in Claim 22 wherein the output pulse of the first monostable of the monostable pair is triggered by a rising edge of the corresponding one of the superhet receiver output signals and the output pulse of the second monostable of the monostable pair is triggered by the falling edge of the corresponding one of the superhet receiver output signals.
24. The apparatus as claimed in Claim 23 wherein the output of the superhet receiver comprises an in-phase signal and a signal in phase-quadrature to the in-phase signal.
25. The apparatus as claimed in Claim 24 wherein a first monostable pair receives the in-phase signal and a second monostable pair receives the signal in phase-quadrature.
26. The apparatus as claimed in Claim 25 wherein the input signal to the superhet receiver is a radio-frequency signal and the output signals from the superhet receiver are intermediate-frequency signals.
27. The apparatus as claimed in Claim 26 wherein the output composite waveform from the summing circuit comprises one pulse, multiplied by the number of monostables, for each

cycle of the in-phase intermediate-frequency signal.

28. The apparatus as claimed in Claim 27 wherein the output pulse of the monostable includes a pulse period, the pulse period is equal to one-half the nominal IF period.

- ~~29.~~ An apparatus for receiving an input signal and outputting a recovered modulated signal, the apparatus comprising:
- a. a superhet receiver for receiving the input signal and for outputting an in-phase signal and one or more phase shifted signals;
  - b. a plurality of monostables for receiving the superhet receiver output signals, the monostables configured into pairs whereby the number of monostable pairs is equal to the number of output signals from the superhet receiver, and each monostable producing an output pulse;
  - c. a summing circuit coupled to each of the monostable output pulses for combining the monostable output pulses into a composite waveform and outputting the composite waveform; and
  - d. a filtering circuit for receiving the composite waveform, recovering a modulated signal and outputting the modulated signal.

30. The apparatus as claimed in Claim 29 wherein the superhet receiver comprises:
- a. an image reject mixer for converting the input signal into an in-phase intermediate-frequency (IF) signal and a phase-shifted IF signal; and
  - b. an IF filter coupled to the image reject mixer for outputting the in-phase and phase-shifted IF signals.

31. The apparatus as claimed in Claim 30 wherein the monostable pair comprises:
- a. a first monostable; and

- b. a serial circuit coupled in parallel to the first monostable, the serial circuit includes an inverter and a second monostable wherein the output of the inverter is coupled to the input of the second monostable.
32. The apparatus as claimed in Claim 31 wherein the monostable pair receives a corresponding one of the superhet receiver output signals.
33. The receiver as claimed in Claim 32 wherein the output pulse of the first monostable of the monostable pair is triggered by a rising edge of the corresponding one of the superhet receiver output signals and the output pulse of the second monostable of the monostable pair is triggered by the falling edge of the corresponding one of the superhet receiver output signals.
34. The apparatus as claimed in Claim 33 wherein the output of the superhet receiver comprises the in-phase signal and a signal in phase-quadrature to the in-phase signal.
35. The apparatus as claimed in Claim 34 wherein a first monostable pair receives the in-phase signal and a second monostable pair receives the signal in phase-quadrature.
36. The apparatus as claimed in Claim 35 wherein the input signal to the superhet receiver is a radio-frequency signal and the output signals from the superhet receiver are intermediate-frequency signals.
37. The apparatus as claimed in Claim 36 wherein the output composite waveform from the summing circuit comprises one pulse, multiplied by the number of monostables, for each cycle of the in-phase intermediate-frequency signal.

38. The apparatus as claimed in Claim 37 wherein the output pulse of the monostable has a pulse period equal to one-half the nominal IF period.
- ~~39.~~ An apparatus for receiving an input signal and outputting a recovered modulated signal, the apparatus comprising:
- a. a superhet receiver for receiving an input signal and for outputting an in-phase signal and a signal in phase-quadrature to the in-phase signal;
  - b. a plurality of monostables for receiving the in-phase signal and the signal in phase-quadrature, the monostables configured into pairs wherein a first monostable pair receives the in-phase signal and a second monostable pair receives the signal in phase-quadrature, and further wherein each monostable produces an output pulse;
  - c. a summing circuit coupled to each of the monostable output pulses for combining the monostable output pulses into a composite waveform and outputting the composite waveform; and
  - d. a filtering circuit for receiving the composite waveform, recovering a modulated signal and outputting the modulated signal.
40. The apparatus as claimed in Claim 39 wherein the number of monostable pairs is equal to the number of superhet receiver output signals.
41. The apparatus as claimed in Claim 40 wherein the monostable pair comprises:
- a. a first monostable; and
  - b. a serial circuit coupled in parallel to the first monostable, the serial circuit includes an inverter and a second monostable wherein the output of the inverter is coupled to the input of the second monostable.



42. The apparatus as claimed in Claim 41 wherein the output composite waveform from the summing circuit comprises one pulse, multiplied by the number of monostables, for each cycle of the in-phase intermediate-frequency signal.
43. A method of demodulating an FM signal using a superhet receiver and a demodulator, the method comprising the steps of:
- a. applying an input signal to the superhet receiver for generating an in-phase signal and a signal in phase-quadrature to the in-phase signal;
  - b. providing the in-phase signal and the signal in phase-quadrature to a plurality of monostables, the monostables configured into pairs wherein a first monostable pair receives the in-phase signal and a second monostable pair receives the signal in phase-quadrature, and further wherein each monostable produces an output pulse;
  - c. summing the plurality of generated output pulses from each of the plurality of monostables in a summing circuit for forming a composite waveform; and
  - d. filtering the composite waveform from the summing circuit in a filtering circuit for outputting a modulated signal therefrom.

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